

CONTRIBUTIONS
FROM THE
CUSHMAN LABORATORY
FOR
FORAMINIFERAL RESEARCH

print the
only!

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CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

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These Contributions will be issued quarterly. They will contain short papers with plates, describing new forms and other interesting notes on the general research work on the foraminifera being done on the group by the workers in this laboratory. New literature as it comes to hand will be briefly reviewed.

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CONTRIBUTIONS FROM THE CUSHMAN LABORATORY FOR FORAMINIFERAL RESEARCH

304. FORAMINIFERA FROM THE RED BLUFF-YAZOO SECTION AT RED BLUFF, MISSISSIPPI*

By JOSEPH A. CUSHMAN and RUTH TODD

In a series of six samples collected at approximately 5-foot intervals by W. H. Monroe at Red Bluff on the Chickasawhay River, Mississippi, the smaller foraminifera were found to be very abundant and well preserved. This series of samples includes at the base four samples of the Yazoo clay of the Jackson group of upper Eocene age, and at the top two samples of the Red Bluff clay of lower Oligocene age from the type locality of the formation. The samples from base to top are numbered as follows: 1Y, 2Y, 3Y, 4Y, 5RB, and 6RB.

There is a distinct difference between sample 6RB (the upper sample of the Red Bluff clay) and all of the Yazoo samples, but 5RB (the lower sample of the Red Bluff) includes a large number of Yazoo specimens, suggesting possible reworking of the upper beds of the Yazoo clay at the time of deposition of the basal beds of the Red Bluff clay. The foraminiferal fauna of the Red Bluff clay indicates that it was deposited in a comparatively shallower sea than the Yazoo, as indicated by the presence of Miliolidae. The Red Bluff fauna, as a whole, is much richer in species than the Yazoo fauna.

Three dominant forms comprise the bulk of the material in all the Yazoo samples: *Bulimina jacksonensis* Cushman, var. *cuneata* Cushman, *Uvigerina yazooensis* Cushman, and *Loxostomum dalli* (Cushman). They are extremely abundant in the Yazoo clay and also occur commonly in the lower sample of the Red Bluff, but are entirely wanting in the upper sample of the Red Bluff, showing that there was a very decided change in the interval represented by these samples.

In order to show the distribution of the species in the different samples, a chart is given with relative abundance indicated by R (rare), C (common), and A (abundant). The chart does not include all the species present as many of them were represented by single or immature specimens. In addition, three lists are given: (1) species restricted to the

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Red Bluff clay, (2) species restricted to the Yazoo clay, but taking into account the apparent reworking of the Yazoo specimens in the lower part of the Red Bluff clay (sample 5RB), and (3) species occurring in both the Yazoo and the typical Red Bluff, i.e., the upper sample (6RB). In order to give references to other occurrences and synonymies for the species, a bibliography of the more recent pertinent papers is given.

A number of the species are apparently new and are described and figured.

MILIOLINELLA ROBUSTA Cushman and Todd, n. sp. (Pl. 1, fig. 3)

Test in the early stages quinqueloculine, later becoming triloculine, broadly rounded; chambers much inflated, fairly distinct; sutures distinct, very slightly depressed; wall smooth and polished; aperture semi-circular with a large, flat tooth in well preserved specimens. Length 0.45-0.52 mm.; breadth 0.35-0.44 mm.; thickness 0.28-0.35 mm.

Holotype (Cushman Coll. No. 56651) from the lower Oligocene, Red Bluff clay, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 6RB.

This species differs from *Miliolinella oblonga* (Montagu) in the more inflated chambers and less depressed sutures.

NODOBACULARIELLA SCITA Cushman and Todd, n. sp. (Pl. 1, fig. 5)

Test planispiral, proloculum followed by a second chamber one coil in length, then followed by chambers one-half coil in length, periphery truncate with the borders slightly keeled; chambers distinct, the earlier ones flattened or concave on the sides, the adult chambers flattened and the apertural end projecting beyond the previous chamber, the intervening area being filled with a thin plate; wall of the early portion smooth, in the adult with longitudinal but slightly tangential costae, somewhat broken and not continuous; aperture at the end of the last-formed chamber, a small, oblique opening in a slight depression surrounded by a distinct everted lip, without a tooth. Length 0.33-0.38 mm.; breadth 0.22-0.25 mm.; thickness 0.07-0.08 mm.

Holotype (Cushman Coll. No. 56654) from the lower Oligocene, Red Bluff clay, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 6RB.

This species differs from *Nodobaculariella multilocularis* (H. B. Brady, Parker, and Jones), var. *ornata* Cushman and Todd in the fewer chambers, more open coiling, and even sides of the adult chambers. In general shape it somewhat resembles the unnamed species figured from the Moodys Branch marl of the Jackson group (Cushman and Todd, Contr. Cushman Lab. Foram. Res., vol. 21, 1945, p. 84, pl. 13, figs. 21, 22), but

the Red Bluff species has a somewhat different shaped adult chamber and is ornamented.

SARACENARIA FRAGILIS Cushman and Todd, n. sp. (Pl. 1, fig. 17)

Test small, in the early stages much compressed, in the adult the ventral face becoming triangular, and tending slightly to uncoil, periphery acute and slightly keeled; chambers numerous, distinct, little if at all inflated, in the later portion increasing rather rapidly but evenly in size as added; sutures distinct, curved, very slightly limbate, not depressed; wall smooth, aperture terminal, radial. Length 0.37-0.45 mm.; breadth 0.20-0.22 mm.; thickness 0.15 mm.

Holotype (Cushman Coll. No. 56668) from the upper Eocene, Yazoo clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 4Y.

This species differs from *Saracenaria hantkeni* Cushman in the keeled periphery, thinner early portion, and less broad apertural face.

AMPHIMORPHINA GRACILIS Cushman and Todd, n. sp. (Pl. 2, figs. 1, 2)

Test small and elongate for the genus, early portion compressed, later portion cylindrical, initial chambers biserial, rapidly becoming uniserial, periphery not indented at the sutures; early chambers compressed, low, rapidly increasing in height as added, adult chambers cylindrical, about $2\frac{1}{2}$ times as high as wide; sutures distinct, strongly arched in the early portion, straight in the later portion, very slightly depressed; wall thin, translucent, finely perforate, ornamented on the adult chambers with about ten high, sharp, not serrate costae, the two on the periphery more prominent than the others, the early portion of the test with about six much less prominent costae; unbroken apertural end not observed. Length at least 1.80 mm., probably greater; diameter of adult portion 0.10-0.15 mm.

Holotype (Cushman Coll. No. 56685) from the upper Eocene, Yazoo clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 4Y.

This species differs from *Amphimorphina yazooensis* Bergquist in the slenderer test, the adult chambers much longer in proportion, and the even, unindented periphery.

VIRGULINA YAZOOENSIS Cushman and Todd, n. sp. (Pl. 2, fig. 4)

Test elongate, tapering from the slightly rounded initial end to the greatest breadth formed by the last two chambers, broadly rounded in section, periphery rounded; chambers distinct, slightly inflated, the last two making up more than half of the surface; sutures distinct, slightly

depressed; wall thin, translucent, smooth; aperture a narrow, elongate, or comma-shaped opening in the terminal face, without a distinct lip. Length 0.32-0.40 mm.; breadth 0.11-0.13 mm.; thickness 0.10 mm.

Holotype (Cushman Coll. No. 56673) from the upper Eocene, Yazoo clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 4Y.

This species differs from *Virgulina dibollensis* Cushman and Applin in the fewer chambers that increase more rapidly in size so that the last two chambers form a large proportion of the test, and in the more rapidly tapering early portion.

VIRGULINA UNCA Cushman and Todd, n. sp. (Pl. 2, fig. 3)

Test small, tapering from the subacute initial end to the greatest breadth slightly above the middle formed by the last two chambers, periphery rounded in the adult, early portion triangular, soon becoming biserial and slightly twisted; chambers of the later portion distinct, strongly inflated, increasing rapidly in size as added, somewhat overlapping; sutures distinct, slightly depressed, very slightly curved, extending backward, strongly oblique; wall distinctly and coarsely perforate, smooth except for the basal margin which at the periphery has a distinct tooth-like projection and occasionally small ones at the side; aperture narrow, extending from the inner periphery to the apex of the last-formed chamber. Length 0.22-0.25 mm.; breadth 0.10 mm.; thickness 0.08 mm.

Holotype (Cushman Coll. No. 56671) from the upper Eocene, Yazoo clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 4Y.

This species differs from *Virgulina keijzeri* Hermes from the upper Eocene of Cuba in the small size, shorter chambers, elongate aperture, and larger number of biserial chambers. It is also much broader and proportionately more tapering.

BOLIVINA SCINTILLO Cushman and Todd, n. sp. (Pl. 2, fig. 5)

Test elongate, tapering from the rounded initial end to the greatest breadth formed by the last two chambers, periphery slightly keeled; chambers numerous, increasing rather rapidly in size as added, later ones slightly inflated; sutures distinct, slightly limbate, strongly curved, later ones slightly depressed; wall smooth, thin, translucent, the middle of the earlier portion sometimes with a slight median ridge; aperture elongate, narrow, on the inner peripheral margin of the last-formed chamber. Length 0.60-0.65 mm.; breadth 0.18-0.23 mm.; thickness 0.12-0.13 mm.

Holotype (Cushman Coll. No. 56675) from the upper Eocene, Yazoo

clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 4Y.

This species differs from *Bolivina jacksonensis* Cushman and Applin in the somewhat higher chambers, more compressed test, smooth wall, and slight keel.

ELLIPSONODOSARIA PILULATA Cushman and Todd, n. sp. (Pl. 2, fig. 8)

Test elongate, slightly curved, periphery very strongly indented; chambers nearly spherical, all of nearly equal size; sutures limbate, very deeply indented; wall thick, translucent, finely perforate, ornamented with a few, inconspicuous, backwardly-projecting, blunt spines, situated in a line around the lower part of each chamber; aperture circular with a slightly flaring lip. Length 0.65 mm. or more; diameter 0.10-0.13 mm.

Holotype (Cushman Coll. No. 56679) from the upper Eocene, Yazoo clay of the Jackson group, Red Bluff, Chickasawhay River, Mississippi, Collected by W. H. Monroe, sample 4Y.

This species differs from *Ellipsonodosaria gracilis* Palmer and Bermudez in the more even size of chambers and less separation by the sutures and the less conspicuous ornamentation.

EPONIDES MINUTISSIMUS Cushman and Todd, n. sp. (Pl. 1, fig. 13)

Test very small for the genus, trochoid, with as many as four whorls, biconvex, slightly if at all inflated, periphery subacute; chambers distinct, slightly inflated on the ventral side, about seven in the adult whorl, increasing very gradually in size as added; sutures distinct, dorsally slightly tangential and not depressed, ventrally nearly radial and slightly depressed; wall thin, translucent, distinctly perforate; aperture a low opening on the ventral border of the last-formed chamber. Diameter 0.13-0.18 mm.; thickness 0.06-0.08 mm.

Holotype (Cushman Coll. No. 56663) from the lower Oligocene, Red Bluff clay, Red Bluff, Chickasawhay River, Mississippi. Collected by W. H. Monroe, sample 6RB.

This species differs from *Eponides minimus* Cushman from the Eocene of South Carolina in the larger number of whorls, smaller size of test, translucent wall, and less oblique sutures.

Species restricted to the Red Bluff clay in this section:

Spiroplectammina howei Stuckey

Textularia recta Cushman

Gaudryina (*Siphogaudryina*) *youngi* Howe

Pseudoclavulina cocoaensis Cushman (Pl. 1, fig. 1)

CONTRIBUTIONS FROM THE CUSHMAN LABORATORY

	YAZOO CLAY				RED BLUFF CLAY	
	1Y	2Y	3Y	4Y	5RB	6RB
<i>Spiroplectammina howei</i>					C.	C.
<i>Spiroplectammina mississippiensis</i> , var. <i>alabamensis</i>	C.	C.	C.	C.		
<i>Textularia recta</i>			R.			R.
<i>Gaudryina</i> (Pseudo.) <i>jacksonensis</i>	R.					C.
<i>Gaudryina</i> (Sipho.) <i>youngi</i>						C.
<i>Pseudocyclonina cocoensis</i>						C.
<i>Karrerella advena</i>						A.
<i>Liebusella byramensis</i> , var. <i>turgida</i>						A.
<i>Miliolinella robusta</i> n. sp.....					A.	A.
<i>Massilina decorata</i>					A.	C.
<i>Spiroloculina occlusa</i>						R.
<i>Spiroloculina spissa</i>						R.
<i>Articulina advena</i>						A.
<i>Articulina byramensis</i>						C.
<i>Articulina jacksonensis</i>						C.
<i>Pyrgo byramensis</i>						C.
<i>Cornuspira byramensis</i>						A.
<i>Nodobacularella scita</i> n. sp.....			A.			R.
<i>Robulus</i> cf. <i>alato-limbatus</i>				C.	R.	
<i>Robulus limbosus</i> , var. <i>hockleyensis</i>	A.	R.			R.	C.
<i>Robulus vicksburgensis</i>				R.		C.
<i>Marginulina</i> cf. <i>abbreviata</i>						R.
<i>Marginulina cocoensis</i>		C.				R.
<i>Marginulina</i> cf. <i>laickeri</i>		R.		R.		
<i>Marginulina subrecta</i>	R.		C.			
<i>Dentalina</i> cf. <i>microstata</i>	R.		R.			C.
<i>Dentalina praecatesbyi</i>						R.
<i>Saracemaria</i> cf. <i>acutauricularis</i>				C.		C.
<i>Saracemaria fragilis</i> n. sp.....		C.				
<i>Saracemaria hankensi</i>	C.		A.			
<i>Frondicularia tenuissima</i>	R.					
<i>Lagena acuticosta</i>	R.				R.	C.
<i>Lagena costata</i>	R.	R.	C.	A.		C.
<i>Guttulina byramensis</i>					C.	C.
<i>Guttulina franki</i>					R.	R.
<i>Globulina alabamensis</i>						C.
<i>Globulina gibba</i>					C.	C.
<i>Globulina gibba</i> , var. <i>punctata</i>					C.	C.
<i>Polymorphina advena</i>						C.
<i>Emulina</i> cf. <i>aculeata</i>						A.
<i>Nonion danvillense</i>	R.	R.	R.	C.		R.
<i>Nonion</i> cf. <i>planatum</i>						A.
<i>Nonionella jacksonensis</i>				R.		
<i>Nonionella jacksonensis</i> , var. <i>compressa</i>						C.
<i>Nonionella tatumi</i>						C.
<i>Ormbelina cubensis</i>	R.	R.	R.	A.	R.	R.
<i>Bolivina rugosa</i>						R.
<i>Bolivina vicksburgensis</i>			R.			R.
<i>Plectofrondicularia</i> cf. <i>mexicana</i>		R.		R.		
<i>Amphimorphina fragilis</i> n. sp.....		C.		C.		
<i>Buliminella madagascariensis</i> , var. <i>spicata</i>						C.
<i>Robertina angusta</i>						A.

FOR FORAMINIFERAL RESEARCH

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	YAZOO CLAY				RED BLUFF CLAY	
	1Y	2Y	3Y	4Y	5RB	6RB
<i>Bulimina jacksonensis</i>C.	.C.	.C.	.C.	.C.	.C.
<i>Bulimina jacksonensis</i> , var. <i>cuneata</i>.....	.A.	.A.	.A.	.A.	.C.	.C.
<i>Entosolenia laevigata</i>.....						.C.
<i>Entosolenia orbignyana</i> , var. <i>flintii</i>.....						.C.
<i>Entosolenia squamosa</i>.....					.R.	.R.
<i>Virgulina unca</i> n. sp. ....	.C.			.C.		.R.
<i>Virgulina vicksburgensis</i>.....						.A.
<i>Virgulina yazooensis</i> n. sp. ....				.C.		
<i>Bolivina gracilis</i>.....	.R.			.R.	.C.	
<i>Bolivina mississippiensis</i> , var. <i>costifera</i>.....					.R.	
<i>Bolivina scintillo</i> n. sp. ....	.C.		.C.	.C.	.R.	
<i>Lomostomm dalli</i>.....	.A.	.C.	.C.	.A.	.C.	
<i>Bifarina vicksburgensis</i>.....			.C.			.C.
<i>Bitubulogenerina howei</i>.....						.A.
<i>Bitubulogenerina vicksburgensis</i>.....						.C.
<i>Reussella byramensis</i>.....						.C.
<i>Uvigerina gardnerae</i> , var. <i>texana</i>.....		.C.	.R.			.C.
<i>Uvigerina vicksburgensis</i>.....					.A.	.A.
<i>Uvigerina yazooensis</i>.....	.A.	.A.	.A.	.A.	.A.	
<i>Angulogerina byramensis</i>.....					.C.	.C.
<i>Angulogerina vicksburgensis</i>.....					.R.	.C.
<i>Eliphaenodosaria pilulata</i> n. sp. ....	.C.	.C.	.C.	.C.		
<i>Eliphaenodosaria cf. granti</i>.....			.R.			
<i>Spirillina subdecorata</i>.....						.R.
<i>Spirillina vicksburgensis</i>.....					.R.	
<i>Patellina advena</i>.....						.R.
<i>Discorbis arcuato-costata</i>.....						.C.
<i>Discorbis cocoensis</i>.....	.A.	.A.	.A.	.A.	.A.	
<i>Discorbis subglobosa</i>.....						.R.
<i>Lamarckina byramensis</i>.....						.C.
<i>Lamarckina glabrata</i>.....						.C.
<i>Heronallenia vicksburgensis</i>.....						.C.
<i>Gyroldina byramensis</i>.....					.A.	.A.
<i>Gyroldina danvillensis</i>.....	.R.			.R.		
<i>Gyroldina vicksburgensis</i>.....					.A.	.A.
<i>Eponides advenus</i>.....						.C.
<i>Eponides minutissimus</i> n. sp. ....						.R.
<i>Eponides ouachitensis</i>.....						.A.
<i>Epistomina coccinea</i>.....	.C.	.A.	.A.	.C.		
<i>Siphonina advena</i>.....					.C.	.A.
<i>Siphonina danvillensis</i>.....	.A.	.R.	.C.	.C.		
<i>Canoris cocoensis</i>.....	.A.	.R.	.C.	.A.		
<i>Alabamina wilcoxensis</i>.....						.C.
<i>Cassidulina crassa</i>.....						.R.
<i>Cassidulina globosa</i>.....	.R.	.C.		.A.		.R.
<i>Pullenia cf. quinqueloba</i> , var. <i>angusta</i>.....			.C.			.R.
<i>Globigerina cf. inflata</i>.....	.A.	.A.	.A.	.A.	.C.	.C.
<i>Hantkenina alabamensis</i>.....						.R.
<i>Anomalina bilateralis</i>.....						.R.
<i>Famulina cocoensis</i>.....	.A.	.A.	.A.	.C.	.C.	
<i>Cibicides cooperensis</i>.....	.A.		.A.	.C.	.C.	
<i>Cibicides lobatulus</i>.....						.C.
<i>Cibicides mississippiensis</i>.....						.C.
<i>Cibicides pipperi</i>.....						.A.

- Karreriella advena* (Cushman) (Pl. 1, fig. 2)
Liebusella byramensis (Cushman), var. *turgida* (Cushman)
Miliolinella robusta n. sp. (Pl. 1, fig. 3)
Massilina decorata Cushman
Spiroloculina occlusa (Cushman)
Spiroloculina spissa Cushman and Todd
Articulina advena (Cushman)
Articulina byramensis Cushman
Articulina jacksonensis Cushman (Pl. 1, fig. 4)
Pyrgo byramensis Cushman and Todd
Cornuspira byramensis Cushman
Nodobaculariella scita n. sp. (Pl. 1, fig. 5)
Robulus vicksburgensis (Cushman)
Dentalina praecatesbyi (Cushman and Todd)
Saracenaria cf. *acutauricularis* (Fichtel and Moll) (Pl. 1, fig. 6)
Guttulina byramensis (Cushman)
Guttulina frankei Cushman and Ozawa (Pl. 1, fig. 7)
Globulina alabamensis Cushman and McGlamery
Globulina gibba d'Orbigny
Globulina gibba d'Orbigny, var. *punctata* d'Orbigny
Polymorphina advena Cushman
Ramulina cf. *aculeata* (d'Orbigny)
Nonion cf. *planatum* Cushman and Thomas
Nonionella jacksonensis Cushman, var. *compressa* Cushman and Todd
Nonionella tatumi Howe
Bolivinella rugosa Howe
Bolivinella vicksburgensis Howe

EXPLANATION OF PLATE 1

FIG. 1. *Pseudoclavulina cocoaensis* Cushman. $\times 45$. 2. *Karreriella advena* (Cushman). $\times 45$. 3. *Miliolinella robusta* Cushman and Todd, n. sp. $\times 65$. *a*, side view; *b*, apertural view. 4. *Articulina jacksonensis* Cushman. $\times 45$. Detached terminal chamber. 5. *Nodobaculariella scita* Cushman and Todd, n. sp. $\times 125$. *a*, side view; *b*, peripheral view. 6. *Saracenaria* cf. *acutauricularis* (Fichtel and Moll). $\times 45$. 7. *Guttulina frankei* Cushman and Ozawa. $\times 45$. 8. *Entosolenia orbignyana* (Seguenza), var. *flintii* (Cushman). $\times 45$. 9. *Uvigerina vicksburgensis* Cushman and Ellisor. $\times 45$. 10. *Gyroidina vicksburgensis* (Cushman). $\times 45$. *a*, dorsal view; *b*, ventral view. 11. *Eponides advenus* (Cushman). $\times 45$. *a*, dorsal view; *b*, ventral view. 12. *E. ouachitaensis* Howe and Wallace. $\times 45$. *a*, dorsal view; *b*, ventral view. 13. *E. minutissimus* Cushman and Todd, n. sp. $\times 125$. *a*, dorsal view; *b*, ventral view; *c*, peripheral view. 14. *Cibicides pippeni* Cushman and Garrett. $\times 45$. *a*, dorsal view; *b*, ventral view. 15. *Marginulina cocoaensis* Cushman. $\times 45$. 16. *Saracenaria hantkeni* Cushman. $\times 45$. 17. *S. fragilis* Cushman and Todd, n. sp. $\times 65$. *a*, side view; *b*, peripheral view.

(Figures 1-14, from Red Bluff clay; 15-17, from Yazoo clay, Mississippi.)





- Buliminella madagascariensis* (d'Orbigny), var. *spicata* Cushman and Parker
Robertina angusta (Cushman)
Entosolenia laevigata (Reuss)
Entosolenia orbignyana (Seguenza), var. *flintii* (Cushman) (Pl. 1, fig. 8)
Entosolenia squamosa (Montagu)
Virgulina vicksburgensis Cushman
Bolivina mississippiensis Cushman, var. *costifera* Cushman
Bifarina vicksburgensis (Cushman)
Bitubulogenerina howei Cushman
Bitubulogenerina vicksburgensis Howe
Reussella byramensis Cushman and Todd
Uvigerina vicksburgensis Cushman and Ellisor (Pl. 1, fig. 9)
Angulogerina byramensis (Cushman)
Angulogerina vicksburgensis Cushman
Spirillina subdecorata Cushman
Spirillina vicksburgensis Cushman
Patellina advena Cushman
Discorbis arcuato-costata Cushman
Discorbis subglobosa Cushman
Lamarckina byramensis Cushman and Todd
Lamarckina glabrata (Cushman)
Heronallenia vicksburgensis Cushman
Gyroidina byramensis Cushman and Todd

EXPLANATION OF PLATE 2

FIGS. 1, 2. *Amphimorphina fragilis* Cushman and Todd, n. sp. $\times 45$. 1, Paratype, adult chambers. 2, Holotype, initial part. 3. *Virgulina unca* Cushman and Todd, n. sp. $\times 125$. *a*, side view; *b*, apertural view. 4. *V. yazooensis* Cushman and Todd, n. sp. $\times 125$. *a*, side view; *b*, apertural view. 5. *Bolivina scintillo* Cushman and Todd, n. sp. $\times 65$. *a*, side view; *b*, apertural view. 6. *Loxostomum dalli* (Cushman). $\times 45$. 7. *Uvigerina yazooensis* Cushman. $\times 45$. 8. *Ellipsonodosaria pilulata* Cushman and Todd, n. sp. $\times 65$. *a*, side view; *b*, apertural view. 9. *Epistomina eocenica* Cushman and M. A. Hanna. $\times 45$. *a*, dorsal view; *b*, ventral view. 10. *Discorbis cocoaensis* Cushman and Garrett. $\times 45$. *a*, dorsal view; *b*, ventral view. 11. *Cibicides cooperensis* Cushman. $\times 45$. *a*, dorsal view; *b*, ventral view. 12. *Pullenia* cf. *quinqueloba* (Reuss), var. *angusta* Cushman and Todd. $\times 45$. *a*, side view; *b*, apertural view. 13-15. *Colomia cretacea* Cushman and Bermudez, n. gen., n. sp. $\times 110$. 13, 15, Paratypes. 14, Holotype. 13, Apertural view. 15, Specimen broken away showing internal tubes. Upper Cretaceous, Cuba. 16. *Pulvinulinella subperuviana* Cushman. $\times 75$. (After Cushman). *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Miocene, California. 17. *Parrella bengalensis* (Schwager). (After Schwager). *a*, dorsal view; *b*, ventral view; *c*, peripheral view. Pliocene, Kar Nicobar. 18-20. *Alabamina wilcoxensis* Toulmin. $\times 52$. (After Toulmin). 18, Ventral view. 19, Peripheral view. 20, Dorsal view. Eocene, Alabama.

(Figures 1-12, from Yazoo clay, Mississippi.)

- Gyroidina vicksburgensis* (Cushman) (Pl. 1, fig. 10)
Eponides advenus (Cushman) (Pl. 1, fig. 11)
Eponides minutissimus n. sp. (Pl. 1, fig. 13)
Eponides ouachitaensis Howe and Wallace (Pl. 1, fig. 12)
Siphonina advena Cushman
Alabamina wilcoxensis Toulmin
Cassidulina crassa d'Orbigny
Hantkenina alabamensis Cushman
Anomalina bilateralis Cushman
Cibicides lobatulus (Walker and Jacob)
Cibicides mississippiensis (Cushman)
Cibicides pippeni Cushman and Garrett (Pl. 1, fig. 14)

Species restricted to the Yazoo clay in this section, but including species which also occur in the probably reworked basal part of the Red Bluff clay:

- Spiroplectamina mississippiensis* (Cushman), var. *alabamensis* (Cushman)
Gaudryina (*Pseudogaudryina*) *jacksonensis* Cushman
Robulus cf. *alato-limbatus* (Gümbel)
Robulus limbosus (Reuss), var. *hockleyensis* (Cushman and Applin)
Marginulina cf. *lalickeri* Cushman
Marginulina subrecta Franke
Saracenaria fragilis n. sp. (Pl. 1, fig. 17)
Saracenaria hantkeni Cushman (Pl. 1, fig. 16)
Frondicularia tenuissima Hantken
Nonionella jacksonensis Cushman, juv.
Plectofrondicularia cf. *mexicana* (Cushman)
Amphimorphina fragilis n. sp. (Pl. 2, figs. 1, 2)
Bulimina jacksonensis Cushman
Bulimina jacksonensis Cushman, var. *cuneata* Cushman
Virgulina unca n. sp. (Pl. 2, fig. 3)
Virgulina yazooensis n. sp. (Pl. 2, fig. 4)
Bolivina gracilis Cushman and Applin
Bolivina scintillo n. sp. (Pl. 2, fig. 5)
Loxostomum dalli (Cushman) (Pl. 2, fig. 6)
Uvigerina gardnerae Cushman, var. *texana* Cushman and Applin
Uvigerina yazooensis Cushman (Pl. 2, fig. 7)
Ellipsonodosaria cf. *granti* (Plummer)
Ellipsonodosaria pilulata n. sp. (Pl. 2, fig. 8)
Discorbis cocoaensis Cushman and Garrett (Pl. 2, fig. 10)

Gyroidina danvillensis Howe and Wallace

Epistomina eocenica Cushman and M. A. Hanna (Pl. 2, fig. 9)

Siphonina danvillensis Howe and Wallace

Cancris cocoaensis Cushman

Planulina cocoaensis Cushman

Cibicides cooperensis Cushman (Pl. 2, fig. 11)

Species occurring in both the Yazoo clay and Red Bluff clay in this section:

Marginulina cf. *abbreviata* Neugeboren

Marginulina cocoaensis Cushman (Pl. 1, fig. 15)

Dentalina cf. *mucronata* Neugeboren

Lagena acuticostata Reuss

Lagena costata (Williamson)

Nonion danvillense Howe and Wallace

Gümbelina cubensis Palmer

Cassidulina globosa Hantken

Pullenia cf. *quinqueloba* (Reuss), var. *angusta* Cushman and Todd (Pl. 2, fig. 12)

Globigerina cf. *inflata* d'Orbigny

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305. *COLOMIA*, A NEW GENUS FROM THE UPPER CRETACEOUS OF CUBA

By JOSEPH A. CUSHMAN and PEDRO J. BERMUDEZ

The following species seems to be new and to represent a new genus of the Foraminifera. It is associated with a very rich and well preserved foraminiferal fauna of a gray calcareous marl facies of the Upper Cretaceous, Habana formation, of Cuba. With it occur well known Upper Cretaceous genera including *Globotruncana*, *Gümbelina*, *Ventilabrella*, *Eowigerina*, and many others.

Genus *COLOMIA* Cushman and Bermudez, new genus

Genoholotype, *Colomia cretacea* Cushman and Bermudez, n. sp.

Test conical; earliest chambers indistinct, later ones uniserial, circular in transverse section, interior with vertical columns or tubular structures connecting walls of the adjacent chambers; wall calcareous, perforate; aperture in the adult terminal, a slightly arcuate, narrow opening in the middle of the apertural face.—Upper Cretaceous.

From its general characters this genus seems to be related to the Recent *Ungulatella* of the Buliminidae.

This genus is named in honor of our mutual friend, Dr. Guillermo Colom, who has contributed so much to the knowledge of the Spanish foraminifera.

COLOMIA CRETACEA Cushman and Bermudez, n. sp. (Pl. 2, figs. 13-15)

Test small, conical, tapering from an acute or slightly spinose initial end to the greatest breadth at the apertural end, circular in transverse section; chambers of the early portion indistinct, later ones uniserial, increasing rather rapidly in diameter in the earlier portion, less so in the adult, interior with vertical columns or tubular structures connecting the basal and upper walls; sutures distinct, slightly raised, smooth; wall calcareous, perforate, the area between the sutures slightly hispid; aperture in the adult terminal, in the middle of the apertural face, narrow, arcuate. Length 0.32-0.37 mm.; diameter 0.22-0.25 mm.

Holotype (Cushman Coll. No. 56625) from the Upper Cretaceous, Habana formation, Marta, Habana Province, Cuba.

306. SOME NOTES ON THE GENERA *PULVINULINELLA*, *PARRELLA*, AND *ALABAMINA*

By JOSEPH A. CUSHMAN

The three genera, *Pulvinulinella* Cushman, 1926, *Parrella* Finlay, 1939, and *Alabamina* Toulmin, 1941, have been considerably confused. A detailed study of species included in these three genera has been made and the conclusion reached that they may all be recognized as valid genera.

Genus *PULVINULINELLA* Cushman, 1926

Genotype, *Pulvinulinella subperuviana* Cushman

(Pl. 2, fig. 16)

Pulvinulinella CUSHMAN, Contr. Cushman Lab. Foram. Res., vol. 2, pt. 3, 1926, p. 62. *Rosalina* (part), *Rotalia* (part), *Truncatulina* (part), *Discorbina* (part), and *Pulvinulina* (part) of authors.

Test trochoid, close-coiled; all chambers visible dorsally, only those of the last-formed whorl from the ventral side, very slightly if at all umbilicate; sutures on the dorsal side oblique, ventrally nearly radial; wall calcareous, perforate; aperture on the ventral side of the peripheral face, elongate, somewhat loop-shaped, nearly parallel to the plane of coiling, not connecting with the umbilical area.—Cretaceous to Recent.

The type species has been studied and apparently the aperture does not connect with the umbilical area.

Genus *PARRELLA* Finlay, 1939

Genotype, *Anomalina bengalensis* Schwager

(Pl. 2, fig. 17)

Parrella FINLAY, Trans. Roy. Soc. New Zealand, vol. 68, 1939, p. 523.

Planorbulina (part) PARKER and JONES, 1865 (not d'ORBIGNY).

Anomalina (part) SCHWAGER, 1866 (not d'ORBIGNY).

Pulvinulina (part) and *Pulvinulinella* (part) of authors.

Test trochoid, close-coiled; all chambers visible dorsally, only those of the last-formed whorl from the ventral side, umbilical area with a distinct solid mass; sutures on both dorsal and ventral sides strongly oblique; wall calcareous, perforate; aperture on the ventral side, a narrow opening extending from the margin into the ventral face at a distinct angle from the axis of coiling with a short slit-like opening at the margin of the chamber extending toward the umbilicus.—Cretaceous to Recent.

This genus differs from *Pulvinulinella* in the decided angle of the aper-

ture and the axis of coiling and the development of the aperture along the ventral margin of the last-formed chamber. In topotype specimens studied from Kar Nicobar the marginal aperture is very indistinct or wanting.

Genus *ALABAMINA* Toulmin, 1941

Genotype, *Alabamina wilcoxensis* Toulmin

(Pl. 2, figs. 18-20)

Alabamina TOULMIN, Journ. Pal., vol. 15, 1941, p. 602.

Pulvinulinella CUSHMAN and PONTON, 1932 (not BURROWS and HOLLAND).

"Test trochiform, usually biconvex, umbilical area closed, periphery bluntly acute or narrowly rounded; all chambers visible from the dorsal side only; dorsal sutures oblique, straight or very gently curved, ventral sutures radiate, straight or slightly curved; wall calcareous, finely perforate; aperture a long narrow opening on the ventral side along the base of the septal face, with supplementary false aperture, consisting of a deep indentation of the wall of the septal face, which is parallel to the periphery on the ventral side and carries no opening into the interior of the chamber."

A further study has been made of specimens from the type locality and they seem to be distinct from either of the other two genera noted here. However in a large series of specimens the deep indentation of the wall parallel to the axis of coiling and near the periphery opens into the interior of the chamber in varying lengths, strongly suggesting the aperture of the *Cassidulina* group.

From a study of these three genera it would seem that *Pulvinulinella* and *Alabamina* strongly suggest that they are intermediate stages toward the aperture of the *Cassidulina* group and should be placed in that family. *Parrella*, on the other hand, with its apertural features may be placed in the Rotaliidae until more ancestral species may be studied in detail.

Specimens of "*Pulvinulina exigua* H. B. Brady, var. *obtusa* Burrows and Holland" from the type figure would seem to have a different character of aperture and a less compressed test, but a series of specimens which I collected a number of years ago from the type locality, Thanet Beds of Pegwell Bay, England, shows characters very close to the American species of the Paleocene, and, as it is one of the common species at the type locality, would indicate that the original figure was inaccurate.

From all the evidence available all three of these genera would seem to be distinct. In a later paper it is hoped that studies now being made will indicate the generic position of the many species belonging in these three genera.

307. SOME NEW GENERA AND SPECIES OF FORAMINIFERA
FROM BRACKISH WATER OF TRINIDAD

By J. A. CUSHMAN and P. BRONNIMANN

The following new forms are from inshore mud in Mangrove swamps of the estuaries of a number of rivers and rivulets of the west coast of Trinidad, B. W. I. Most of the samples come from the coastal area between Caroni River in the north and Godineau River in the south. The fauna is quite an unusual one and contains a number of undescribed genera and species. A later paper will deal with the entire fauna and will describe the ecologic conditions of these deposits.

Family SACCAMMINIDAE

Genus LAGUNCULINA Rhumbler, 1903

LAGUNCULINA VADESCENS Cushman and Bronnimann, n. sp. (Pl. 3, figs. 1, 2)

Test consisting of a single, nearly spherical chamber broadly rounded at the base and at the apertural end with a short, wide, circular neck and distinct flaring lip; wall very thin, consisting of very fine sand grains of rather uniform size; aperture large, circular at the end of the short, apertural neck. Length of holotype 0.25 mm.; diameter 0.20 mm.

Holotype (Cushman Coll. No. 56628) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *L. urnula* (Gruber) in the more spherical form, very short neck, and much larger aperture.

Genus LEPTODERMELLA Rhumbler, 1935

LEPTODERMELLA SALSA Cushman and Bronnimann, n. sp. (Pl. 3, figs. 3, 4)

Test consisting of a single chamber, flattened or somewhat concave at the base and strongly curved, nearly hemispherical dorsally; wall arenaceous, thin, chitinous with fine sand grains, the surface fairly smooth; aperture in the depression of the ventral side, regularly cruciform, the inner ends rounded. Height 0.25 mm.; diameter 0.35 mm.

Holotype (Cushman Coll. No. 56630) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *L. arenata* Cushman in the higher and more rounded form and the cruciform aperture.

Family LITUOLIDAE

Genus LABROSPIRA Höglund, 1947

This genus differs from *Haplophragmoides* in the position of the aperture in the apertural face. There are numerous species which have been referred to *Haplophragmoides* and *Trochammina* that belong here.

LABROSPIRA SALSA Cushman and Bronnimann, n. sp. (Pl. 3, figs. 5, 6)

Test close coiled, consisting of two or more coils, planispirally arranged, slightly umbilicate; chambers usually 6 or 7 to a coil, distinctly inflated, increasing rather rapidly in size as added; sutures distinct, depressed, nearly radial; wall arenaceous, very smoothly finished, somewhat polished; aperture in the early stages at the base of the margin of the apertural face, in the adult removed from the base, rounded, in the apertural face, with a distinct raised border. Length 0.50-0.65 mm.; breadth 0.50-0.55 mm.; thickness 0.25-0.32 mm.

Holotype (Cushman Coll. No. 56632) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *Haplophragmoides canariensis* (d'Orbigny) in the more compressed early coil, less rounded chambers, smooth surface, and the aperture in the apertural face instead of at the base.

Genus **AMMOBACULITES** Cushman, 1910

AMMOBACULITES SALSUS Cushman and Bronnimann, n. sp. (Pl. 3, figs. 7-9)

Test elongate, somewhat compressed, earlier portion planispirally coiled, later becoming uniserial; chambers fairly distinct except in the early coiled portion, increasing rapidly in size in the uniserial portion, the last-formed chamber in the adult equalling the size of the earlier portion, slightly inflated, apertural end somewhat tapering; sutures of the later portion somewhat depressed; wall thin, rather coarsely arenaceous, somewhat chitinous and fairly smooth on the exterior; aperture circular, fairly large at the constricted end of the last-formed chamber. Length 0.50-0.60 mm.; breadth 0.20-0.30 mm.; thickness 0.13-0.20 mm.

Holotype (Cushman Coll. No. 56634) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *A. cassis* (Parker) in the less compressed test, fewer and more inflated uniserial chambers, and abrupt change from the coiled to the uniserial stage.

Genus **HAPLOPHRAGMIUM** Reuss, 1860

HAPLOPHRAGMIUM SALSUM Cushman and Bronnimann, n. sp. (Pl. 3, figs. 10-13)

Test elongate, earliest chambers planispiral, later and larger portion of test uniserial, circular in transverse section; chambers few in the coiled portion, the uniserial chambers as many as 7, usually 4 or 5; sutures distinct, slightly depressed; wall arenaceous, of fine sand grains, very smoothly finished on the surface; aperture in the adult, cribrate, consisting of a series of small rounded openings in the outer convex wall of the last-formed chamber. Length 0.85-1.35 mm.; breadth 0.28-0.32 mm.; thickness 0.25-0.32 mm.

Holotype (Cushman Coll. No. 56636) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *H. lituolinoideum* Goës in the more distinct chambers, cylindrical adult portion, and smooth surface.

Genus **AMMOASTUTA** Cushman and Bronnimann, new genus

Genoholotype, *Ammoastuta salsa* Cushman and Bronnimann, n. sp.

Test in the earliest portion planispiral, close coiled, becoming uncoiled very early and in the adult the chambers elongate, curved, each forming more than half the periphery of the oval test; wall arenaceous, smoothly finished; aperture a series of very minute pores on the curved lower end of the last-formed chamber.

AMMOASTUTA SALSA Cushman and Bronnimann, n. sp. (Pl. 3, figs. 14-16)

Test similar to the description of the genus, the last-formed chambers each longer than the preceding and extending beyond the previous one at the base, occasionally not reaching as far at the upper end; wall very finely arenaceous with much chitin, thin, very smoothly finished; aperture apparently consisting of very fine pores at the rounded basal end of the last-formed chamber, occasionally with a suggestion of a very small opening in the middle of the ventral face. Length 0.40-0.50 mm.; breadth 0.25-0.38 mm.; thickness 0.10-0.13 mm.

Holotype (Cushman Coll. No. 56638) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *A. inepta* (Cushman and McCulloch) in its larger size and especially its much broader form.

Family TROCHAMMINIDAE

Genus **TROCHAMMINITA** Cushman and Bronnimann, new genus

Genoholotype, *Trochamminita irregularis* Cushman and Bronnimann, n. sp.

Test in the early stages trochoid as in *Trochammina*, later with the chambers added in a very irregular manner; wall arenaceous, thin, partially chitinous; aperture in the irregular adult portion consisting of a rounded opening in the chamber wall with a slightly raised border.

TROCHAMMINITA IRREGULARIS Cushman and Bronnimann, n. sp. (Pl. 4, figs. 1-3)

Test in the early stages trochoid, usually consisting of but few chambers, globular and distinctly chitinous, in some, probably microspheric individuals, with the trochoid stage continuing longer, later adult chambers assuming various irregular shapes; wall coarsely arenaceous, thin, the exterior rather roughly finished; aperture in the early trochoid stage a slit at the base of the chamber, in the irregular adult chambers a small,

rounded opening in the chamber wall, with a raised border. Length 0.45-0.55 mm.; diameter 0.30-0.45 mm.

Holotype (Cushman Coll. No. 56640) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

At first sight this form might be taken for *Sorosphaera* or allied forms but a careful study of a large series of specimens showed the *Trochammina* stage present in varying degrees.

Family NONIONIDAE

Genus **CRIBROELPHIDIUM** Cushman and Bronnimann, new genus

Genotype, *Criboelphidium vadeszens* Cushman and Bronnimann, n. sp.

Test similar to *Elphidium* but with the apertural face with a series of supplementary apertures consisting of small, rounded openings, with or without a raised border, in the apertural face.

Numerous species previously assigned to *Elphidium* have this apertural character but mainly those species which have a rounded periphery and comparatively few chambers. The typical *Elphidium* apparently does not have them.

CRIBROELPHIDIUM VADESCENS Cushman and Bronnimann, n. sp. (Pl. 4, fig. 5)

Test small, rather strongly compressed, periphery rounded, umbilicus not depressed; chambers distinct, averaging about 9 in the adult coil, very slightly inflated in the later portion, increasing very gradually in size as added; sutures fairly distinct, very slightly depressed in the later portion, with numerous, rather short, retral processes; wall smooth, coarsely and distinctly perforate, the umbilical area occasionally with one or more small bosses; aperture a row of small openings at the inner margin of the last-formed chamber with a double row of small, rounded openings in a vertical position in the apertural face. Length 0.30-0.35 mm.; breadth 0.25-0.30 mm.; thickness 0.15-0.18 mm.

Holotype (Cushman Coll. No. 56643) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *Elphidium discoidale* (d'Orbigny) in the smaller size, fewer chambers, more compressed test, and the umbilicus not raised.

CRIBROELPHIDIUM KUGLERI Cushman and Bronnimann, n. sp. (Pl. 4, fig. 4)

Test small, planispiral, umbilicate; chambers distinct, strongly inflated, increasing rather evenly in size as added, 6 or 7 in the adult coil; sutures distinct, depressed, with 6 to 8 retral processes visible in side view; wall smooth, distinctly but finely perforate, nearly transparent; aperture consisting of several very small openings at the peripheral

margin of the last-formed chamber with several rounded openings in the apertural face tending to be in a horizontal series. Length 0.25-0.32 mm.; breadth 0.22-0.25 mm.; thickness 0.15-0.18 mm.

Holotype (Cushman Coll. No. 56642) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *Elphidium magellanicum* Heron-Allen and Earland in the slightly larger number of chambers, more even form and more radial sutures. It is named for Dr. H. G. Kugler who has contributed so much to the understanding of the geology of Trinidad.

CRIBROELPHIDIUM SALSUM Cushman and Bronnimann, n. sp. (Pl. 4, fig. 6)

Test small, somewhat compressed, periphery broadly rounded, umbilicus slightly raised; chambers fairly distinct, averaging about 10 in the adult coil, increasing very gradually in size as added; sutures fairly distinct, often slightly limbate in the earlier portion with numerous, very slightly developed retral processes; wall smooth, finely but distinctly perforate, the umbilical area with one fairly large or several small bosses; aperture a series of small openings at the inner margin of the last-formed chamber, with a few, small rounded openings in the middle of the apertural face. Length 0.30-0.35 mm.; breadth 0.25-0.30 mm.; thickness 0.13-0.17 mm.

Holotype (Cushman Coll. No. 56644) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *C. vadeszens* n. sp. in the slightly thicker test, tendency to limbate sutures, less conspicuous retral processes, and the supplementary apertures in a group in the middle of the apertural face.

CRIBROELPHIDIUM LIMOSUM Cushman and Bronnimann, n. sp. (Pl. 4, fig. 7)

Test small, somewhat compressed, periphery broadly rounded, umbilicus not depressed; chambers not inflated, rather indistinct, averaging about 8 in the adult coil, increasing very slightly in size as added; sutures slightly excavated, with indistinct retral processes; wall smooth, very coarsely perforate, umbilical area with a group of small, rounded areas or smooth; aperture a series of small, rounded openings at the inner margin of the last-formed chamber with a few small openings in the apertural face. Length 0.30-0.38 mm.; breadth 0.22-0.27 mm.; thickness 0.12-0.17 mm.

Holotype (Cushman Coll. No. 56645) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species differs from *Elphidium incertum* (Williamson), var. *mexicanum* Kornfeld in the fewer chambers, more rounded periphery, and more sharply cut sutures.

CRIBROELPHIDIUM TRINITATENSIS Cushman and Bronnimann, n. sp. (Pl. 4, fig. 8)

Test small, strongly compressed, periphery rounded; chambers indistinct except for the sutures which are marked by deep retral processes, about 10 chambers in the adult coil; wall smooth but distinctly perforate, umbilicus with a small boss; aperture consisting of several openings at the base of the apertural face and in the adult with several rounded openings in the apertural face, each with a raised border. Length 0.25-0.30 mm.; breadth 0.25-0.28 mm.; thickness 0.12-0.14 mm.

Holotype (Cushman Coll. No. 56646) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

This species resembles *Criboelphidium articulatum* (d'Orbigny) from the Falkland Islands in the larger and more elongate retral processes and umbilical boss. From d'Orbigny's type figure his species evidently had apertures in the ventral face and belongs in this genus.

Family ROTALIIDAE

Genus DISCORINOPSIS Cole, 1941

DISCORINOPSIS VADESCENS Cushman and Bronnimann, n. sp. (Pl. 4, figs. 9, 10)

Test trochoid, plano-convex, dorsal side convex, ventral side flattened, periphery subacute to slightly rounded; chambers distinct on the dorsal side, averaging about 10 in the adult whorl, increasing rather rapidly but evenly in size as added, the last few slightly inflated on the dorsal side; sutures of the later part slightly depressed, curved; wall of the dorsal side smooth but very coarsely perforate, ventral side covered with a secondary growth of irregular shape; aperture in the early stages a narrow slit at the ventral border of the last-formed chamber near the margin, in the adult consisting of a low opening near the ventral margin at the periphery with a slight lip and also numerous irregular openings into the secondary growth on the ventral side. Length 0.40-0.55 mm.; breadth 0.35-0.50 mm.; thickness 0.12-0.15 mm.

Holotype (Cushman Coll. No. 56647) from inshore mud, brackish water, Mangrove swamp, west coast of Trinidad, B. W. I.

EXPLANATION OF PLATE 3

FIGS. 1, 2. *Lagunculina vadeszens* Cushman and Bronnimann, n. sp. 1, Holotype, side view; 2, Paratype, apertural view. 3, 4. *Leptodermella salsa* Cushman and Bronnimann, n. sp. 3, Holotype, apertural view. 4, Paratype, side view. 5, 6. *Labrospira salsa* Cushman and Bronnimann, n. sp. 5, Paratype. 6, Holotype. a, side view; b, apertural view. 7-9. *Ammobaculites salsus* Cushman and Bronnimann, n. sp. 7, Holotype, a, side view; b, apertural view. 8, 9, Paratypes. 10-13. *Haplophragmium salsum* Cushman and Bronnimann, n. sp. 10, Holotype. 11-13, Paratypes. 11, Section showing interior apertures. 12, Apertural end with apertures. 13, Young stage. 14-16. *Amoastuta salsa* Cushman and Bronnimann, n. gen., n. sp. 14, Holotype. 15, 16, Paratypes. a, side view; b, edge view.

All figures $\times 80$

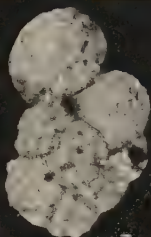




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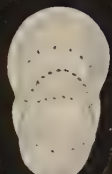
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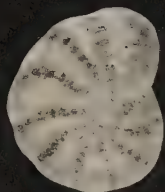
3



4a



4b



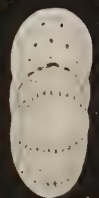
5a



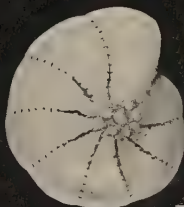
5b



6a



6b



7a



7b



8a



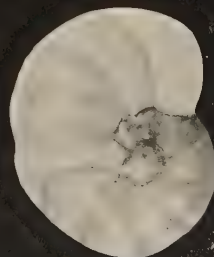
8b



9a



9b



10

This species differs from *D. gunteri* Cole in the much smaller size, larger number of chambers in the adult whorl, and more complex ventral side.

308. A NEW SPECIES OF *NONION* (FORAMINIFERA) FROM THE WOODS HOLE REGION¹

By W. S. BUTCHER

Abstract A new species of the foraminiferal genus *Nonion* is described. The habitat of this species is the brackish water of the tidal ponds of Cape Cod, Massachusetts. It is apparently living in the ponds today and is thus a Recent species. The proposed name is *Nonion tisburyensis*.

INTRODUCTION

In the course of a geological investigation of the tidal ponds of Cape Cod and nearby islands, the fauna of the sediments was noted. It was recognized that in the surface layers and for an undetermined depth below, a species of *Nonion* was very abundant. In order to identify this species, Cushman's monograph on the Nonionidae (Cushman 1939) was consulted. It was evident to the author that the species found in the ponds was decidedly different from any of those figured by Cushman. The relationship of this foraminifer to the genus *Nonion* is evident from the planispiral perforate calcareous test with the simple aperture at the base of the apertural face (Cushman 1940). The appearance of foraminifera in the brackish pond water and the lack of correspondence with any described species has lead the author to propose the new species *Nonion tisburyensis*. The specific name has been derived from the name of the pond where first found, Tisbury Great Pond, Marthas Vineyard, Massachusetts. It is also found at Great Pond, Falmouth, Massachusetts, and presumably elsewhere in the general area in brackish water. In both

¹ Contribution No. 401 from the Woods Hole Oceanographic Institution.

EXPLANATION OF PLATE 4

FIGS. 1-3. *Trochamminita irregularis* Cushman and Bronnimann, n. gen., n. sp. 1, Holotype. 2, 3, Paratypes. 4. *Criboelphidium kugleri* Cushman and Bronnimann, n. gen., n. sp. 5. *C. vadeszens* Cushman and Bronnimann, n. sp. 6. *C. salsum* Cushman and Bronnimann, n. sp. 7. *C. limosum* Cushman and Bronnimann, n. sp. 8. *C. trinitatensis* Cushman and Bronnimann, n. sp. 9, 10. *Discorinopsis vadeszens* Cushman and Bronnimann, n. sp. 9, Holotype. 10, Paratype.

All figures $\times 80$. a, side view; b, peripheral view.

localities it inhabits brackish* water which may be frozen during the winter months.



FIGURES 1-3. *Nonion tisburyensis* Butcher, n. sp. $\times 60$. 1, Holotype. 2, 3, Paratypes. 1, 3, Side views. 2, Apertural view.

DESCRIPTION

Nonion tisburyensis n. sp.

Text figures 1-3

Test planispiral, nearly circular in side view, slightly longer than wide; 7-9 chambers in the last formed whorl. Broadly rounded angles. Somewhat involute giving a crescentic apertural face. Umbilicus slightly depressed. Chambers inflated slightly and sutures simple and depressed forming lobate periphery. Some deposition of shell material at umbilicus, but no stellate deposition. Wall smooth, very finely punctate in early chambers, becoming coarser but still fine in later. Aperture a narrow arched slit at base of apertural face. Diameter: 0.64 mm. Thickness: 0.27 mm. Habitat: brackish tidal ponds of Cape Cod, Mass.

The type specimens are deposited at the Cushman Laboratory for Foraminiferal Research, Sharon, Mass. Holotype (Cushman Coll. No. 51893); Paratypes (Nos. 51894-6).

CONCLUSION

It is clear from the foregoing description and figures that an undescribed species of *Nonion* is here represented. Phleger (personal communication) has not encountered any similar form in samples from the

* At the type locality the salinity of the water ranges from 20 to 30. Normal sea water has a salinity of 35.

open ocean bottom off Cape Cod and thus this form may be confined entirely to brackish water. It seems worthy of a separate species name from its habitat and differences in form from described species.

This species differs from closely related species particularly in the number of chambers of the test and in their inflated nature. In addition the depressed umbilicus and the lack of shell material deposition at this point are characteristic. Cushman (personal communication) suggests that this species is related to *Nonion pauciloculum* (Cushman 1944) as described from sandy mud in Buzzards Bay, Massachusetts. The latter species has an average of 7 chambers in the adult whorl.

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- Cushman, J. A. (1939) A Monograph of the Foraminiferal Family Nonionidae: U. S. Geol. Survey Prof. Paper 191.
Cushman, J. A. (1940) Foraminifera: Harvard University Press, Cambridge Mass.
Cushman, J. A. (1944) Foraminifera from the Shallow Waters of the New England Coast. Special Publication No. 12, Cushman Lab. Foram. Res., Sharon, Mass., p. 24.

309. NOTE ON THE OCCURRENCE OF *UVIGERINA MEXICANA* NUTTALL IN THE STE. CROIX FORMATION OF TRINIDAD, B. W. I.

BY J. A. CUSHMAN and H. H. RENZ

In a recent publication by J. A. Cushman and H. H. Renz, entitled "The Foraminiferal Fauna of the Oligocene, Ste. Croix Formation, of Trinidad, B. W. I." (Special Publ. 22, Cushman Lab. Foram. Res., Dec. 19, 1947, p. 28, pl. 6, fig. 16), mention is made of the occurrence of *Uvigerina mexicana* Nuttall in both the Ste. Croix and Trinidad Point calcareous clay faunas. This is an error of identification which we wish to correct with the present note. The specimens erroneously referred to this species are rather like *Uvigerina beccarii* Fornasini as described by Cushman from the upper Oligocene of Aguide, Eastern Falcón, Venezuela (Contr. Cushman Lab. Foram. Res., vol. 5, 1929, p. 95, pl. 13, fig. 37) and we therefore provisionally refer it to this species. Although variable in its ornamentation, it has generally much fewer, stronger and less regular costae than *Uvigerina mexicana* Nuttall.

In the Caribbean region, the true *Uvigerina mexicana* Nuttall appears to be an excellent time-stratigraphic marker for the lower and probably middle Oligocene and has not been reported from undoubted upper Oligo-

cene in this region. As pointed out elsewhere (loc. cit., p. 1), the two described faunas originate from the upper part (upper Oligocene) of the Ste. Croix formation but its lower part (middle Oligocene), such as developed at Kapur Quarry of South Trinidad, contains *Uvigerina mexicana* Nuttall in its correct stratigraphic position.

In Contribution No. 300 of this series in the previous issue, some new foraminifera from Ecuador were described. Acknowledgment needs to be made to the International Petroleum Company of Toronto for making this material available and for permitting publication.

RECENT LITERATURE ON THE FORAMINIFERA

Below are given some of the more recent works on the foraminifera that have come to hand:

Chapman, Frederick. The Foraminifera of the Funafuti Boring.—Ann. Mag. Nat. Hist., ser. 11, vol. 11, Feb. 1944, pp. 98-110.—Lists of the foraminifera are given with the names revised to present nomenclature.

Ovey, C. D. A new Eocene Species of *Lockhartia* Davies, from British Somaliland, with Notes on other Species of the Genus.—L. c., vol. 13, Aug. 1947, pp. 571-576, pls. X, XI.—A new species, *Lockhartia huntii*, described and figured and several other species also figured.

Parr, W. J. An Australian Record of the Foraminiferal Genus *Hantkenina*.—Proc. Roy. Soc. Victoria, vol. LVIII, pts. I-II, (New Series), June 25, 1947, pp. 45-47, 7 text figs.—A new subspecies described and figured, *H. alabamensis* Cushman, subsp. *compressa*.

The Lagenid Foraminifera and Their Relationships.—L. c., pp. 116-133, pls. VI, VII, 1 text fig.—A discussion of the relationships is given and a new genus erected, *Parafissurina* (genotype *Lagena ventricosa* A. Silvestri) replacing *Ellipsolagena* (genotype *Lagena acutissima* Fornasini), a synonym of *Fissurina*.

Grimsdale, Thomas Francis, and Alan Hilder Smout. Note on the Aperture in *Nummulites* Lamarck.—Proc. Geol. Soc. London, No. 1436, Nov. 26, 1947, pp. 14, 15.

de Neve, G. A. A New *Archaias* Species from East Borneo.—Bull. Bureau Mines and Geol. Survey in Indonesia, vol. 1, No. 1, 1947, pp. 13-16, text figs. 1-4.—A new species, *A. vanderwerkeri*, described.

Kikoïne, J. Mise au point sur la nomenclature de *Globorotalia Cushmani* Morrow.—Comptes Rendus Soc. Geol. France, Nov. 10, 1947, pp. 287-289, text fig.—The characters of this species are reviewed and complete description given with added notes on its distribution and relationships.

- Destombes, J.-P. and P. Marie.** Resultats stratigraphiques d'un sondage a Peyrehorade (Landes).—L. c., Dec. 15, 1947, pp. 330-333.
- Marie, Pierre.** Sur quelques *Rosalinella* du sondage de Peyrehorade.—L. c., pp. 333-335.—These two papers include a discussion of the same species as the preceding paper.
- McLean, James D., Jr.** Oligocene and Lower Miocene Microfossils from Onslow County, North Carolina.—Notulae Naturae, Acad. Nat. Sci. Phila., No. 200, Dec. 12, 1947, pp. 1-9.—Lists and ranges of species given from well samples.
- Cushman, J. A., and H. H. Renz.** The Foraminiferal Fauna of the Oligocene, Ste. Croix formation, of Trinidad, B. W. I.—Special Publ. 22, Cushman Lab. Foram. Res., Dec. 19, 1947, pp. 1-46, pls. 1-8.—Over 275 species and varieties recorded, 5 new.
- Stewart, Grace Ann, and Lois Lampe.** Foraminifera from the Middle Devonian Bone Beds of Ohio.—Journ. Pal., vol. 21, No. 6, Nov. 1947, pp. 529-536, pls. 78, 79.—Two new genera, *Sorosphaeroidea* (genotype *S. polygona* n. sp.) and *Webbinelloidea* (genotype *W. similis* n. sp.), of the family Saccamminidae are erected and 13 new species described and figured.
- Scott, Harold W., Edward Zeller, and Doris Nodine Zeller.** The Genus *Endothyra*.—L. c., pp. 557-562, pls. 83, 84, 2 text figs.—Details of structure and development are given.
- Hanzawa, Shoshira.** Check list of Tertiary larger foraminifera of Japan.—L. c., pp. 563-569.
- ten Dam, A.** Structure of *Asterigerina* and a new species.—L. c., pp. 584-586, text figs. 1-6.—A new species, *A. lutetiana*, is described from the middle Eocene of the Netherlands.
- Grimsdale, T. F.** Upper Cretaceous Foraminifera: a Criticism.—L. c., pp. 586, 587.
- Cushman, Joseph A.** Foraminiferal Evidence for the age of the Velasco shale of Mexico and the Lizard Springs marl of Trinidad.—L. c., p. 587.
- Frizzell, Don L.** Lectotype of *Spiroplectammina grzybowskii*.—L. c., vol. 22, No. 1, Jan. 1948, p. 106.
- Knight, J. Brookes, and J. Marvin Weller.** The application of Opinion 138 to some recently published names.—L. c., pp. 107-110.
- de Cizancourt, Mme.** Nummulites de l'Ile de la Barbade (Petites Antilles).—Mém. Soc. Géol. France, n. ser., vol. XXVII, Mem. 57, 1948, pp. 1-40, pls. I, II, 1 text fig. (map).—Several species described and figured, five new.
- Driver, Herschel L.** Genesis and Evolution of Los Angeles Basin, California.—Bull. Amer. Assoc. Petr. Geol., vol. 32, No. 1, Jan. 1948, pp. 109-125, 4 figs.—Includes a chart with a number of foraminifera as index species.





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